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EXAMINER

ARNOLD, ADAM

ART UNIT PAPER NUMBER

2671

DATE MAILED: 07/20/2004

8

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/056,317

Applicant(s)

KNITTEL, GUENTER

Examiner

Adam Arnold

Art Unit

2671

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-36 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-36 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____ | 6) <input type="checkbox"/> Other: ____ |

DETAILED ACTION

The examiner acknowledges the receipt and entry of the applicant's amendment.

1. The indicated allowability of claims 18-28 is withdrawn in view of the newly discovered reference(s) to Sturgess, U.S. Patent Application Publication 2003/0196041.

Rejections based on the newly cited reference(s) follow.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1, 4-6, 11, 15, 18, 21-23, 29, 33, 34 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sturgess, U.S. Patent Application Publication 2003/0196041. Referring to claim 1, Sturgess discloses an apparatus comprising a data set stored on a machine-readable media (paragraph 36), wherein: the data set is divided in multiple subsets (paragraph 39, i.e. data stored at different locations in memory), a spread memory layout defining multiple pages in memory (paragraph 11), with a subset of data mapped to predetermined portions of each page (paragraph 11); and each page is sized to map to quick access memory of a processor (paragraph 17), such that data when fetched from the machine-readable media are mapped into one or more predetermined portions of quick access memory (paragraph 17). Sturgess does not disclose the portions being less than the capacity of each page. At the time the invention was made, it would have been

Art Unit: 2671

obvious to a person of ordinary skill in the art to have the portions being less than the capacity of each page. One of ordinary skill in the art would have been motivated to do this in order to separate data from other information, thereby avoiding the risk of overwriting important information (paragraph 25).

Referring to claim 4, Sturgess discloses where the quick access memory is on-chip processor cache (paragraph 36) and the size of each page having data corresponds to the size of the cache (paragraph 15).

Referring to claim 5, Sturgess discloses where the page maps to processor cache (paragraph 19).

Referring to claim 6, Sturgess discloses where the apparatus is adapted for use with n-way associative cache (paragraph 41) and the size of each page having data equals the size of the cache divided by n (paragraphs 41 and 36).

Referring to claim 11, Sturgess does not disclose processing parameters being stored in a page of memory at a location other than the one or more predetermined portions to inhibit overwrite of parameters by image data. Sturgess does disclose partitioning cache so that data and instructions use different partitions. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to process parameters being stored in a page of memory at a location other than the one or more predetermined portions to inhibit overwrite of parameters by image data. One of ordinary skill in the art would have been motivated to do this in order to protect the contents of data against unexpected eviction (paragraph 25).

Referring to claim 15, the remarks presented above with respect to claims 1 and 11 apply equally to this claim.

Art Unit: 2671

Referring to claim 18, the remarks presented above with respect to claims 1 and 11 apply equally to this claim.

Referring to claim 21, the remarks presented above with respect to claims 4 and 11 apply equally to this claim.

Referring to claim 22, the remarks presented above with respect to claims 5 and 11 apply equally to this claim.

Referring to claim 23, the remarks presented above with respect to claims 6 and 11 apply equally to this claim.

Referring to claim 29, the remarks presented above with respect to claims 1 and 11 apply equally to this claim.

Referring to claim 33, the remarks presented above with respect to claims 6 and 29 apply equally to this claim.

Referring to claim 34, the remarks presented above with respect to claims 4 and 33 apply equally to this claim.

Referring to claim 36, the remarks presented above with respect to claims 1 and 11 apply equally to this claim.

4. Claims 2, 3, 7-10, 12-14, 16, 17, 19, 20, 24-28, 30-32 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sturgess in view of Lauer, U.S. Patent No. 6,243,098. Referring to claim 2, Sturgess does not disclose where the data set is volumetric data, and each subset is selected to be like-sized cubic regions. Lauer discloses volumetric voxel data (see Abstract) and blocks, which are all the same size (Figure 11). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to have a data set which is volumetric data, and each subset is

Art Unit: 2671

selected to be like-sized cubic regions. One of ordinary skill in the art would have been motivated to do this because “voxel-based representations of objects occur in many situations and application” (col. 1, line 27).

Referring to claim 3, Sturgess does not disclose where each cubic region includes an 8x8x8 cube of voxels. Lauer discloses where the region includes an 8x8x8 cube (col. 9, line 62). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to have an 8x8x8 cube of voxels. One of ordinary skill in the art would have been motivated to do this so that all of the voxels of a size bxbxb are stored at consecutive addresses (col. 9, line 59).

Referring to claim 7, Sturgess does not disclose sizing each page such that a subset of data from the data set occupies less than one-half of page size and loading the data into processor cache, no more than half of cache capacity. Lauer discloses fitting 64 subsets in a page burst, which is less than one-half (col. 20, lines 21-33). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to have a subset of data from the data set occupies less than one-half of page size and loading the data into processor cache, no more than half of cache capacity. One of ordinary skill in the art would have been motivated to do this in order to require less internal storage (col. 8, line 63).

Referring to claim 8, Sturgess discloses where each subset occupies one or more predetermined, consistent locations within a page (paragraph 17). Sturgess does not disclose sizing each page such that a subset of data from the data set occupies less than one-quarter of page size. Lauer discloses fitting 64 subsets in a page burst, which is less than one-quarter (col. 20, lines 21-33). At the time the invention was made, it would

Art Unit: 2671

have been obvious to a person of ordinary skill in the art to have a subset of data from the data set occupies less than one-quarter of page size. One of ordinary skill in the art would have been motivated to do this in order to require less internal storage (col. 8, line 63).

Referring to claim 9, Sturges does not disclose where each subset occupies a specific contiguous location within each page at least one kilobyte in size. Lauer discloses blocks sized to 512 voxels (col. 32, line 8) and 2 byte voxels (col. 29, line 12), which gives 1 kilobyte. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to have each subset occupy a specific contiguous location within each page at least one kilobyte in size. One of ordinary skill in the art would have been motivated to do this in order to fetch an entire block of data in a burst rather than one voxel at a time (col. 8, line 53).

Referring to claim 10, Sturges does not disclose where each page occupies at least 4 kilobytes in size. Lauer discloses 64 subsets in a page burst (col. 20, lines 21-33) and blocks sized to 1 kilobyte (see claim 9 above). The page burst size is therefore 64 kilobytes. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to have each page at least four kilobytes in size. One of ordinary skill in the art would have been motivated to do this in order to fetch an entire block of data in a burst rather than one voxel at a time (col. 8, line 53).

Referring to claim 12, Sturges does not disclose where the data for each subset is stored on the machine-readable media in a dimensionally-interleaved manner. Lauer discloses where adjacent voxels are shaded alike and are stored in the same page burst; they are cubic and occupy all three dimensions (col. 20, lines 21-33 and Figure 11). At

Art Unit: 2671

the time the invention was made, it would have been obvious to a person of ordinary skill in the art to have each subset stored on the machine-readable media in a dimensionally-interleaved manner. One of ordinary skill in the art would have been motivated to do this in order to speed data processing (col. 8, lines 11-15).

Referring to claim 13, the remarks presented above with respect to claim 12 apply equally to this claim.

Referring to claim 14, the remarks presented above with respect to claim 12 apply equally to this claim.

Referring to claim 16, the remarks presented above with respect to claim 12 and 15 apply equally to this claim.

Referring to claim 17, the remarks presented above with respect to claim 12 and 15 apply equally to this claim.

Referring to claim 19, the remarks presented above with respect to claim 2 apply equally to this claim.

Referring to claim 20, the remarks presented above with respect to claim 3 apply equally to this claim.

Referring to claim 24, the remarks presented above with respect to claim 7 apply equally to this claim.

Referring to claim 25, the remarks presented above with respect to claim 8 apply equally to this claim.

Referring to claim 26, the remarks presented above with respect to claim 9 apply equally to this claim.

Art Unit: 2671

Referring to claim 27, the remarks presented above with respect to claim 12 apply equally to this claim.

Referring to claim 28, the remarks presented above with respect to claim 12 apply equally to this claim.

Referring to claim 30, the remarks presented above with respect to claims 12 and 29 apply equally to this claim.

Referring to claim 31, the remarks presented above with respect to claims 12 and 29 apply equally to this claim.

Referring to claim 32, the remarks presented above with respect to claims 12 and 29 apply equally to this claim.

Referring to claim 35, Sturgess does not disclose where the processor performs raycasting using the data set. Lauer discloses where voxels are used in raycasting (col. 14, lines 61-65). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to have the processor perform raycasting using the data set. One of ordinary skill in the art would have been motivated to do this in order to reduce the amount of storage required within the processing pipeline (col. 11, lines 5-6).

Response to Arguments

The claim rejections under 35 U.S.C. 112 have been withdrawn.

The examiner has provided new grounds of rejection and therefore, the remainder of the arguments are moot. In light of the new grounds of rejection, this action is Non-Final.


Art Unit: 2671

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Adam Arnold whose telephone number is 703 305 8413. The examiner can normally be reached on Monday through Friday from 7:30 A.M. to 4:30 P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Zimmerman, can be reached on 703 305 9798. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


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